ORIGINAL ARTICLE

Ossiculoplasty With Titanium Prosthesis

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KEYWORDS
Middle ear; Ossiculoplasty; PORP; TORP; Titanium prosthesis

Abstract
Objectives: The goal of this study was to make a review of the patients who underwent ossicular chain reconstruction with titanium prosthesis during an 8-year period in our Department.
Methods: A retrospective study was made on the ossiculoplasty cases over a period of eight years in a Public Hospital District. The information was extracted by clinical process consultation. Between 1999 and 2008, 124 ossiculoplasties using Kurz® titanium prosthesis for chronic otitis media were performed (78 partial ossicular chain reconstructions and 46 total ossicular chain reconstructions). The single stage, staged and revision ossicular chain reconstruction were included in the analysis. All patients had a minimum of 6-month postoperative follow-up (mean 3 years and 4 months). Comparisons of preoperative and postoperative pure tone averages were performed. Air-bone gap and implant extrusion rates were measured. The success of the reconstruction was defined as a postoperative air-bone gap (ABG) of 20 dB or better.
Results: Successful ossiculoplasty was obtained in 73.1% of partial ossicular chain reconstructions and 30.4% of total ossicular chain reconstructions (P<.05). The postoperative pure-tone average air-bone gaps was 16 dB in partial reconstructions and 26.7 dB in total reconstructions (P<.05). There were five cases of prosthesis extrusion.
Conclusions: The majority of the ossiculoplasties improved the hearing status satisfactorily. There was no difference in hearing results in one-stage and two-stage partial ossicular chain reconstruction, but there were better hearing results in the cases of two-stage total ossicular chain reconstruction.
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PALABRAS CLAVE
Oído medio; Osisuloplastia; PORP; TORP; Prótesis de titanio

Resumen
Objetivos: Revisión de los pacientes sometidos a una reconstrucción de la cadena osicular con prótesis de titanio durante un período de ocho años en nuestro Servicio.
Métodos: Hemos revisado retrospectivamente las ossiculoplastias realizadas durante un periodo de ocho años en un hospital público de distrito. La información se ha obtenido mediante consulta del proceso clínico. Entre 1999 y 2008, se realizaran 124 ossiculoplastias usando la prótesis de titanio.

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de titanio de Kurz® en casos de otitis media crónica (78 reconstrucciones parciales y 46 reconstrucciones totales de la cadena osicular). Se incluyeron en el análisis las reconstrucciones en un solo tiempo y dos tiempos quirúrgicos, así como las cirugías de revisión. Todos los pacientes tuvieron un seguimiento mínimo posquirúrgico de 6 meses (un promedio de 3 años y 4 meses). Se realizaron comparaciones del promedio de tonos puros óseo y aéreo pre y posquirúrgico. Se midieron los porcentajes de la brecha aérea-ósea y los casos de extrusión de la prótesis. Utilizamos como criterio de éxito la brecha aérea-ósea inferior o igual a 20 dB. Resultados: Se lograron osiculoplastias con éxito en el 73,1% de las reconstrucciones osiculares parciales y en el 30,4% de las reconstrucciones osiculares totales (p < 0,05). El promedio de la brecha aérea-ósea posquirúrgica fue de 16 dB en las reconstrucciones parciales y de 26,7 dB en las reconstrucciones totales (p < 0,05). Se produjeron cinco casos de extrusión de la prótesis. Conclusiones: La mayoría de las osiculoplastias mejoró satisfactoriamente la audición. No se produjo diferencia alguna en los resultados audiométricos de la reconstrucción de la cadena osicular parcial entre uno o dos tiempos quirúrgicos, aunque se obtuvieron mejores resultados audiométricos en los casos de reconstrucción de la cadena osicular total en dos tiempos quirúrgicos.

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defined as a postoperative ABG of 20 dB or more, with a minimum follow-up of 6 months.

All group comparisons were analysed using SPSS software (version 18.0).

Results

In the PORP group (78 patients), 62 individuals (79.5%) underwent ossicular reconstruction in a single stage and 16 (20.5%) underwent treatment staging (Table 1). We performed 49 reconstructions of the ossicular chain without mastoidectomy and 30 mastoidectomies with ossicular reconstruction (Table 2).

The mean preoperative PTA-ABG was 29 dB and the mean postoperative PTA-ABG was 16±9.9 dB, which represents a mean hearing increase of 13.2±12.1 dB (Table 3).

In conducting the review of our results based on the ABG, we found that ossiculoplasty was successfully achieved in 57 of 78 patients (73.1%), corresponding to 46 cases of single-stage partial ossicular reconstruction (74.1%) and to 11 cases of reconstruction in two stages (68.8%) (Table 3). We had only 2 cases (2.5%) of review surgery due to recurrent cholesteatoma and extrusion of the prosthesis.

In general, there was an improvement of hearing in the majority of the PORP group (Figs. 1 and 2).

In the TORP group (46 patients), 26 individuals (56.5%) underwent ossicular reconstruction in one stage (43.5%) and 20 underwent a procedure in various stages (Table 3). We carried out 28 ossicular chain reconstructions without mastoidectomy and 18 mastoidectomies with reconstruction of the ossicular chain (Table 2).

The group that underwent TORP implantation had a mean preoperative PTA-ABG of 37 dB, with the mean postoperative PTA-ABG being 26.7±11.3 dB, representing a hearing increase of 10.3±12.4 dB.

Table 2 Type of Surgery Performed in the TORP and PORP Groups.

<table>
<thead>
<tr>
<th>Group</th>
<th>Type of Surgery</th>
<th>No.</th>
<th>Ossiculoplasty Without Mastoidectomy</th>
<th>Mastoidectomy With Ossiculoplasty</th>
</tr>
</thead>
<tbody>
<tr>
<td>PORP</td>
<td>Single-stage</td>
<td>35</td>
<td></td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>Two stages/review</td>
<td>14</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>TORP</td>
<td>Single-stage</td>
<td>10</td>
<td></td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Two stages/review</td>
<td>18</td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

Table 3 Preoperative Versus Postoperative PTA-ABG.

<table>
<thead>
<tr>
<th>Group</th>
<th>Preoperative PTA-ABG, dB</th>
<th>Postoperative PTA-ABG, dB</th>
<th>Mean Auditory Increase, dB</th>
</tr>
</thead>
<tbody>
<tr>
<td>PORP No.=78</td>
<td>Single stage No.=62</td>
<td>29.70</td>
<td>16.90</td>
</tr>
<tr>
<td></td>
<td>Various stages No.=16</td>
<td>29.35</td>
<td>17.10</td>
</tr>
<tr>
<td>TORP No.=46</td>
<td>Single stage No.=26</td>
<td>37.75</td>
<td>27.70</td>
</tr>
<tr>
<td></td>
<td>Various stages No.=20</td>
<td>37.60</td>
<td>27.20</td>
</tr>
</tbody>
</table>

PTA-ABG: pure-tone audiometry air-bone gap.
### Table 4 Results of the Air-Bone Gap With TORP and PORP.

<table>
<thead>
<tr>
<th>ABG, Postoperative dB</th>
<th>SHOOP</th>
<th>TORP</th>
<th>PORP</th>
<th>TORP</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–10</td>
<td>43.5 (27/62)</td>
<td>25 (4/16)</td>
<td>3.8 (1/26)</td>
<td>10 (2/20)</td>
</tr>
<tr>
<td>11–20</td>
<td>30.6 (19/62)</td>
<td>43.8 (7/16)</td>
<td>11.5 (3/26)</td>
<td>40 (8/20)</td>
</tr>
<tr>
<td>21–30</td>
<td>19.4 (12/62)</td>
<td>18.7 (3/16)</td>
<td>30.8 (8/26)</td>
<td>40 (8/20)</td>
</tr>
<tr>
<td>&gt;30</td>
<td>6.5 (4/62)</td>
<td>12.5 (2/16)</td>
<td>53.9 (14/26)</td>
<td>10 (2/20)</td>
</tr>
</tbody>
</table>

ABG: air-bone gap.
Figures in bold represent successful ossiculoplasties.

### Discussion

The primary goal of surgery for chronic otitis media is the achievement of a safe, dry ear, disruption of recurrent ear drainage, and hearing improvement. Primary surgery consists in eradication of the disease (cholesteatoma and/or irreversibly diseased mucosa), which creates a middle ear fistula with air occupation, restoring the integrity of the tympanic membrane. In our service, ossicular chain reconstruction with titanium prostheses is performed in a single surgical stage in all cases, except in those in which complete resection of the problem is questionable, and when there is severe mucosal stripping.

In terms of hearing results, there is no difference between partial ossicular chain reconstruction (PORP) in one stage or in various stages.

There was audiometric improvement in total reconstruction (TORP) in two stages, compared to surgery in a single stage.

Based on the observation of our results, we should carry out a retrospective study of our strategies relating to cases of total reconstruction in a single stage. Because of the greater extent of the disease, it would probably be advisable to cure the middle ear in the first place, ensure a space in the middle ear with air occupation and then finally reconstruct the ossicular chain.

Compared to the literature consulted, we obtained similar results in partial ossicular reconstructions and in total ossicular reconstructions in various stages, although worse results were obtained in single-stage complete reconstructions.7,11,12

We also found that our hearing results were similar to those of other series that used different prosthetic materials, such as autologous bones or hydroxyapatite.13,14

### Conclusions

Most ossiculoplasties improved hearing conditions satisfactorily.

We obtained better results with partial implants than with total implants. The rate of extrusions of prostheses was higher than that reported in the literature.1,9–12
References